Memorandum

Date: June 17, 2010

To: Kathy Harder
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, Ste 200
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From: Gerald E. Johns, Deputy Director
Department of Water Resources

Subject: Comments on Issue Paper for Aquatic Life and Wildlife Preservation, Prepared for the Sacramento County Sanitation District's National Pollutant Discharge Elimination System Permit Renewal

The Department of Water Resources (DWR) appreciates the opportunity to provide comments on the Central Valley Regional Water Quality Control Board's (Central Valley Regional Board) issue paper pertaining to the National Pollutant Discharge Elimination System (NPDES) permit renewal process for the Sacramento Regional County Sanitation District (SRCSD) Wastewater Treatment Plant discharge to the Sacramento River. This letter augments our comments submitted February 4, 2010, regarding potential drinking water supply and public health impacts associated with SRCSD's proposed expansion.

DWR's interest in providing these comments stems directly from the agency's mission to manage the water resources of California in cooperation with other agencies to benefit the State's people, and to protect, restore, and enhance the natural and human environments. In particular, we are concerned with potential impacts of SRCSD's ongoing and planned future discharge on the overall health of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Delta), and the implications for management of California's water supply.

The Issue Paper prepared by the Central Valley Regional Board staff represents a constructive step towards assessing the potential effects associated with increasing SRCSD's discharge on the Sacramento River and the Delta. Additional information and data analysis are needed; however, before stakeholders can fully evaluate the effects of the proposed increase in discharge on water quality and aquatic life. The Issue Paper evaluates several important stressors that could impair aquatic life and other beneficial uses. These include ammonia, pesticides, and effluent toxicity, which require thorough consideration in order to assess the potential impacts of a substantial increase in SRCSD's discharge. The following are DWR's specific comments regarding these issues.

Elevated ammonia concentrations, pesticide contamination, low dissolved oxygen, and whole effluent toxicity are well documented problems in the Delta (Synthesis of Toxicity data for the Sacramento-San Joaquin Delta 2000-2008, Draft). Current research suggests these stressors may play a role in the

decline of pelagic species resident in the Delta, a phenomenon commonly referred to as the Pelagic Organism Decline (POD). Central Valley Regional Board staff has summarized previous research regarding the potential impacts of ammonia and other wastewater constituents on aquatic life in the Sacramento River and the Delta, but much research is ongoing.

Urban discharge from multiple sources is still being investigated as contributing to the POD. For example, research completed as recently as May 2010 concludes that changes in nutrient concentrations are correlated with changes in the Delta's food web and the changes are directly related to the POD (Glibert, 2010). Therefore, existing nutrient discharges are a concern and the proposed increase in average dry weather discharge flow from 181 to 218 million gallons per day (mgd) is extremely problematic.

In addition, although ammonia concentrations downstream of the discharge point may not be high enough to cause acute toxicity, little is understood about the effects of chronic and sublethal exposures on fish, invertebrates, and lower trophic populations. For example, studies conducted with delta smelt by the University of California at the Davis Aquatic Toxicology Laboratory (UCD ATL) showed that ammonia associated with SRCSD effluent was 30-40% more toxic to larval smelt than ammonia by itself (Werner 2009). Camargo and Alonso (2006) note "mixtures of ammonia and other chemical pollutants, such as copper, cyanide, phenol, zinc, and chlorine (with the formation of inorganic chloramines), may result in additive toxicity or even cause synergistic effects. According to Dr. Teh of UC Davis, the unknown contaminants in addition to unionized ammonia may have contributed to the low survival of the copepod species *Eurytemora affinis*. His test, conducted with samples collected from the DWR water quality monitoring station at Hood on the Sacramento River in April, 2009, resulted in 95% mortality to *E. affinis* (Teh 2008). Given the potential implications for the POD, we recommend these issues be further evaluated as part of the permit review process with the goal of reducing these ongoing toxicity effects.

While acute LC50 levels for ammonia have not exceeded USEPA guidance levels for acute ammonium, chronic and sublethal effects may be occurring. Surface grab samples by the UCD ATL for POD water collections have recorded unionized ammonia levels at or near 0.02mg/l downstream of the outfall, which is higher than the predicted chronic concentration for *E. affinis* and *Pseudodiaptomus forbesi* (.011mg/l and .006mg/l respectively). Previous studies indicate fish that are stressed or actively swimming are more likely to be prone to ammonia toxicity (Eddy 2005). In addition, the permeability of the gills and body surface varies with temperature and generally the permeability of biological membranes increases by a factor of two and three for a 10°C increase in temperature (Eddy 2005).

Current SRCSD effluent can be discharged at 20-25°F over the receiving water temperature. Not only can increase in temperature raise the proportion on unionized ammonia in the water, but it may also facilitate entry of ammonia into the fish via increased permeability. Thus the discharge could be affecting migrating salmon in an additive manner.

In studies, the LC50 for total ammonia for resting fish decreased by approximately 75% for swimming fish. The current acute values (USEPA 1999) may not protect swimming salmonids and much lower levels of ammonia in the water may impair swimming performance (Eddy 2005). Accordingly, we recommend these conditions be evaluated for chronic effects.

Cascade effects through the food chain to upper trophy levels may also be occurring in the north Delta. Studies have suggested at present discharge concentrations, the addition of ammonia to the Sacramento River at River Mile 44 could be inhibiting the access of phytoplankton to ambient NO3, causing a shift in nitrogen utilization from nitrate to ammonia (Parker and Dugdale, IEP Ammonia Summit 2009). It has been determined that the phytoplankton community composition has generally shifted from large diatoms towards smaller flagellate species such as *Microcystis aeruginosa* (Lehman et al. 2005, Jassby 2008). Compared to NO_3 and N_2 as nitrogen sources, NH_4 produces the highest growth and primary production rates for *Microcystis aeruginosa* and other cyanobacteria in laboratory studies (Ward and Wetzel 1980). Higher nutrient loads, coupled with natural low summer flows and higher temperatures, could be the cause for the increase of the prevalence of *Microcystis* blooms in the Delta. Calanoid copepods, particularly *Eurytemora affinis* and *Pseudodiaptomus forbesi,* are the principal food source for larval fish such as delta smelt, and dietary *Microcystis* reduces copepod survival even at low dietary ratios. This suggests that increased nutrients could have direct impacts on copepods (Ger et al, 2009), and thus subsequently delta smelt and other pelagic fishes. As such, elevated levels of ammonium may contribute to a food shortage for the invertebrates that are in turn the primary food organisms for the POD fishes.

We suggest further study and evaluation of thermal impacts associated with SRCSD's proposal to discharge effluent 20-28° F above ambient water temperatures. The concern is that migration of salmon and steelhead may be impeded by a thermal plume. As indicted in the Issue Paper, both federal and State guidelines state that mixing zones shall not restrict the passage of aquatic life. Existing modeling studies of plume dispersion have not been validated by discrete or continuous monitoring of water quality parameters. Nor have fish tracking studies have been undertaken to validate the SRCSD anti-degradation analysis paper's assumption that fish will maneuver around rather than travel through a plume.

These thermal concerns are related to other concerns DWR has about dissolved oxygen (DO). DWR recently found that SRCSD measurements of DO concentrations in the Sacramento River near Freeport California tended to be higher than Central Valley Regional Board's and DWR's DO levels measured downstream of the SRCSD discharge. It is unclear whether this difference is due to the calibration or malfunction of SRCSD's monitoring equipment. If there was a problem with the DO measurements exceeding permitted levels, additional discharge may result in additional exceedances of regulated DO levels. It could be helpful to examine a longer record of SRCSD Quality Assurance/Quality Control records during periods when DO levels were near compliance levels to determine if actual values may have exceeded permitted levels. This could be useful in developing more reliable projections of possible DO levels under future scenarios.

Referenced in the issue paper were contaminants of emerging concern (CECs). These include pharmaceuticals and personal care products (PPCP's). Studies have found compounds such as caffeine and pharmaceuticals in the Sacramento River originating from urban discharges (Guo et. al. May 2010). The point was made in the Central Valley Regional Board Issue Paper that these are not currently regulated and therefore not enforceable. Even though these compounds are not currently regulated, this does not eliminate the concern over possible effects in the Delta. Striped bass in the Delta appear to have undergone a sex ratio shift away from 50/50 to 90% males and 10% females (Sommer et. al. Nov. 2009). Additional studies could provide information about expression of PPCP exposure in whole effluent to species of concern, such as striped bass. To this end, the Central Valley Regional Water Board should consider incorporating permit conditions requiring monitoring and special studies related to the effects CEC's on aquatic life.

In summary, the Delta ecosystem is complex and the scientific understanding of the stressors addressed in the issue paper is dynamic. Existing and ongoing research already suggest that the current loading from waste water treatment facilities to the Delta may already be adversely affecting aquatic life directly and through food web interactions. SRCSD is proposing to expand its discharge volume by as much as 55 percent while, at the same time, evidence is mounting to support reducing nutrient and effluent loading to the Delta. We therefore encourage the Central Valley Regional Board staff to continue its efforts to more comprehensively evaluate the potential effects of SRCSD's proposed expanded discharge on aquatic life and other beneficial uses and consider reductions in the current discharge.

DWR appreciates the Central Valley Water Board staff efforts in preparing the Issue Paper and the many challenges associated with assessing these important issues. Please feel free to contact Dean Messer, Chief of Environmental Services, DWR, at 916-376-9700 if you have any questions regarding these comments.

Sincerely,

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Attachment: References

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